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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09 994,284	11 26 2001	Sang Ick Lee	CU-2636 VE	8830

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EXAMINER

PHAM, THANH V

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 05 23 2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/994,284

Examiner

Thanh V Pham

Applicant(s)

LEE ET AL

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: on page 4, lines 15-16, "the dummy gate, exposed by CMP, is remove" should belong to FIG. 1D; on page 5, lines 11-12, "between the field area **h** and the active area **t**" used to define "a step difference **a**" does not clearly define the step difference.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-3, 5-6 and 8-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In this instance, the term "high selection ratio" in claim 1 is subjective.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

5. Claims 1 and 8 are rejected under 35 U.S.C. 102(a) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over applicant's admitted prior art.

The applicant's admitted prior art as explained in figures 1 and 2 and the background of the invention has a method of forming a gate in a semiconductor device, *that is not different from the detailed description of the preferred embodiments referring to FIG. 3A to 3F*, comprising the steps of:

forming a dummy gate insulating layer 2 on a semiconductor substrate 1 having a field oxide layer isolating the device (not shown, page 3, lines 13-14);

depositing a dummy gate polysilicon layer 3 and a hard mask layer 4 on the dummy gate insulating layer 2 sequentially;

patterning the hard mask 4 into a mask pattern 4a and patterning the dummy gate polysilicon layer 3 using the mask pattern as an etch barrier;

forming spacers 6 at both sidewalls of the dummy gate polysilicon layer 3;

depositing an insulating interlayer 7 on the resultant structure 5 after forming the spacers 6;

exposing a surface of the dummy gate polysilicon layer by carrying out an oxide layer CMP process, page 4, line 14;

forming a damascene structure by removing the dummy gate polysilicon layer and the dummy gate insulating layer using the insulating interlayer as another etch barrier, fig. 1D, page 4, lines 15-16 and page 5, lines 1-3;

depositing a gate insulating layer 8 and a gate metal layer on the entire surface of the semiconductor substrate having the damascene structure, fig. 1E; and

exposing a surface of the insulating interlayer by carrying out a metal chemical mechanical polishing process.

The metal CMP uses slurry for a metal layer, page 13, lines 6-19.

The selection ratio in the CMP process of applicant's admitted prior art includes a "high selection ratio" as recited due to the subjectivity of the term "high" discussed above.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 2-7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art as applied to claims 1 and 8 above, and further in view of Maniar et al. U.S. Patent No. 5,356,833 and the following

In the description of applicant's admitted prior art the applicant does not state the thickness of the dummy gate polysilicon layer or the insulating interlayer, the polishing selection ratios between the insulating interlayer and the dummy gate polysilicon layer is over 20 or the gate metal layer is over 50, the using of CeO_2 and its pH between 3 and 11 in the insulating interlayer CMP and the pH between 2 and 7 of the slurry in the metal layer CMP.

Choice of 1,300 to 2,000 angstroms for the gate layer and 4,000 to 5,000 angstroms for the interlayer and choice of the polishing selection ratios to achieve particular device properties would have been a matter of routine optimization because the thickness and the polishing selection ratios are known to affect device properties and would depend on the desired device density on the finished wafer and the desired device characteristics.

Maniar et al. reference discloses use of CeO_2 as slurry in CMP process in the variation of topologies with a pH in a range of about 2-5, the pH outside the range may be used (col. 4, lines 23-40 and col. 5, line 57 to col. 6, line 29). *The recited selection ratios would be obtained because the same materials are treated in the same manner as in the instant invention.*

It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the ceria and the suggested pH range of Maniar et al. reference into the applicant's admitted prior art as the ceria and the pH would have been selected in accordance with the formation of a gate in a semiconductor device of the applicant's admitted prior art.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh V Pham whose telephone number is 703-308-2543. The examiner can normally be reached on M-F (8:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 703-308-4918.

The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 (7724, 3431 and 3432) for regular communications and 703-308-7382 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

TvP
May 17, 2002


George Foursor
Primary Examiner
2823